
25 NOV

Fig 1.

Fig 2

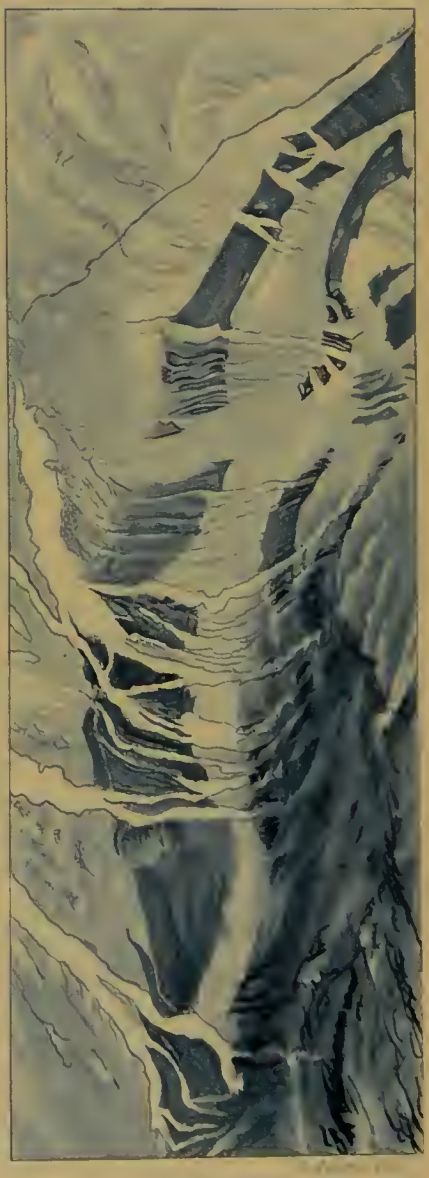

Fig 3

ROCK VEINS

under Contraction at two periods.

Extracted from the Geological Magazine. Vol. IV. No. 11. November, 1867].

ON BRECCIATED FORMATIONS.

By John Ruskin. Esq., F.G.S.

(PLATE XX.)

(Continued from the August Number, p. 339).

I WROTE the first of these papers more with a view of obtaining some help in my own work than with any purpose of carrying forward the discussion of the subject myself. But no help having been given me, I must proceed cautiously alone, and arrange the order of my questions; since, when I have done my best as carefully as I can, the papers will be nothing but a series of suggestions for others to pursue at their pleasure.

Let me first give the sense in which I use some necessary words:

1. Supposing cavities in rocks are produced by any accident, or by original structure (as hollows left by gas in lava), and afterwards filled by the slow introduction of a substance which forms an element of the rock in which the cavities are formed, and is finally present, in the cavities, in proportion to its greater or less abundance in the rock; I call the process "secretion."

2. But if the cavities are filled with a substance not present (or not in sufficient quantity present), in the surrounding rock, and therefore necessarily brought into them from a distance, I call the process, if slow, "infiltration"; if violent, "injection."

It is evident that water percolating a rock may carry a substance, present in the mass of it, by infiltration, into the cavities, and so imitate the process of secretion. But there are structural differences in the aspect of the two conditions hereafter to be noticed. The existence of permanent moisture is however to be admitted among conditions of secretion; but not of fluent moisture, introducing foreign elements.

3. If a crystalline or agatescent mass is formed by addition of successive coats, I call the process "accretion."

4. But if the crystalline or agatescent mass separates itself out of another solid mass, as an imbedded crystal, or nodule, and then, within its substance, divides itself into coats, I call the process "concretion." The orbicular granite of Elba is the simplest instance I can refer to of such manifest action; but all crystals, scattered equally through a solid enclosing paste, I shall call "concrete" crystals, as opposed to those which are constructed in freedom out of a liquid or vapour in cavities of rocks, and which I shall call "accrete."

The fluor nodules of Derbyshire, and amethystine nodules of some trap rocks, present, in their interiors, the most beautiful phenomena of concrete crystallization, of which I hope to give careful drawings.

It is true, as I said in the last paper, that these two processes are perpetually associated, and also that the difference between them is sometimes only between coats attracted and coats imposed. A small portion of organic substance will, perhaps, attract silica to itself, out of a rock which contained little silica in proportion to its substance; and this first knot of silica will attract more, and, at last, a large mass of flint will be formed, which I should call "concrete;" but if a successive overflowing of a silicious spring had deposited successive layers of silica upon it, I should call it "accrete." But the resemblance of the two processes in such instances need not interfere with the clearness of our first conception of them; nor with our sense of the firm distinction between the separation of a solid mass, already formed, into crystals or coats in its interior substance, and the increase of crystalline or coated masses by gradual imposition of new matter.

Now let me re-state the scope of the questions, for the following out of which I want to collect materials :—

I. I suspect that many so-called "conglomerates" are not conglomerates at all, but concretionary formations, capable, finally, of complete mechanical separation of parts; and therefore that even some states of apparently rolled gravel are only dissolutions of concretionary rock.

Of course, conglomerates, in which the pebbles are fragments of recognizable foreign rocks, are beyond all possibility of challenge; as also those in which the nodules could not, by any chemistry, have been secreted from the surrounding mass. But I have in my hand, as I write, a so-called "conglomerato" of red, rounded, flint "pebbles," much divided by interior cracks, enclosed by a finely crystallized quartz; and I am under the strongest impression that the enclosed pieces are not pebbles at all; but secretions — the spots on a colossal bloodstone. It is with a view to the solution of this large question, that I am examining the minor structure of brecciated agates and flints.

II. It seems to me that some of the most singular conditions of crystalline metamorphic rocks are the result of the reduction of true conglomerates into a solid mass; and I want therefore to trace the changes in clearly recognizable conglomerates, where they are affected by metamorphism; and arrange them in a consistent series.

III. I cannot, at present, distinguish in rocks the faults, veins, and brecciations, caused by slow contraction, from those occasioned by external pressure or violence. It seems to me now that many distortions and faults, which I have been in the habit of supposing the result of violence, are only colossal phenomena of retraction or contraction: and even that many apparent strata have been produced by segregation. A paper, on this subject, of Mr. George Maw's, put into

my hands in May, 1863, gave me the first suggestion of this possibility.

I shall endeavour, as I have leisure, to present such facts to the readers of this Magazine as may bear on these three enquiries; and have first engraved the plate given in the present number in order to put clearly under their consideration the ordinary aspect of the veins in the first stage of metamorphism in the Alpine cherts and limestones. The three figures are portions of rolled fragments; it is impossible to break good specimens from the rock itself, for it always breaks through the veins, and it must be gradually ground down in order to get a good surface.

Fig. 1 is a portion of the surface of a black chertose mass; rent and filled by a fine quartzose deposit or secretion, softer than the black portions and yielding to the knife: neither black nor white parts effervesce with acids: it is as delicate an instance of a vein with rent fibrous walls as I could find (from the superficial gravel near Geneva).

Fig. 2 is from the bed of the stream descending from the Aiguille de Varens to St. Martin's. It represents the usual condition of rending and warping in the flanks of veins caused by slow contraction, the separated fragments showing their correspondence with the places they have seceded from; and it is evident that the secretion or injection of the filling white carbonate of lime must have been concurrent with the slow fracture, or else the pieces, unsupported, would have fallen asunder.

Fig. 3 is from the bed of the Arve at St. Martin's, and shows this condition still more delicately. The narrow black line traversing the white surface, near the top, is the edge of a film of slate, once attached to the dark broad vertical belt, and which has been slowly warped from it as the carbonate of lime was introduced. When the whole was partly consolidated, a second series of contractions has taken place; filled, not now by carbonate of lime, but by compact quartz, traversing in many fine branches the slate and calcite, nearly at right angles to their course.

I shall have more to say of the examples in this plate in connection with others, of which engravings are in preparation.

STEPHEN AUSTIN, PRINTER, HERTFORD.